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FRIDAY, APRIL 8, 1921

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A NEW AGENCY FOR THE POPULARIZATION OF SCIENCE

IN a democracy like ours it is particularly important that the people as a whole should so far as possible understand the aims and achievements of modern science, not only because of the value of such knowledge to themselves but because research directly or indirectly depends upon popular appreciation of its methods. In fact the success of democratic government as well as the prosperity of the individual may be said to depend upon the ability of the people to distinguish between real science and fake, between the genuine expert and the pretender.

The education of children in schools and of a few in colleges is not sufficient for this. It must be carried into maturity through such channels as the newspapers and the motion pictures. Unfortunately the rapid advance and increasing complexity of modern science has made it difficult for the general reader to follow its course and he has often given up the attempt in despair. Consequently we find the reading public divided into two classes as may be discerned in any public reading room; a minority that habitually read the scientific journals and a majority that never touch even the most popular of them.

In the effort to bridge this gap and to aid in the dissemination of scientific information, a new institution, the Science Service, has been established at Washington. It is chartered as a non-profit-making corporation and all receipts from the sale of articles, books or films will be devoted to the development of new methods of popular education in science. The governing board of fifteen trustees consists of ten scientists and five journalists.

The charter is a wide one, authorizing Science Service to publish books and magazines, to conduct conferences and lecture

courses and to produce motion pictures. Its first conference was held last summer at San Diego, California, on the problems of the Pacific, and another is planned for next summer on urbanization and ruralization.

Science Service will not at present undertake to publish any periodical of its own, for it is believed that much better results can be obtained by devoting the same effort and expense to reaching a wider range of readers through newspapers and to directing attention to the various well-edited periodicals of popular science already in existence rather than attempting to rival them.

Science Service will aim to act as a sort of liaison officer between scientific circles and the outside world. It will endeavor to interpret the results of original research as they appear in the technical journals and proceedings of societies in a way to enlighten the layman. The specialist is likewise a layman in every science except his own and he, too, needs to have new things explained to him in non-technical language.

We may not all go so far as Tolstoy who said that you can explain Kant to a peasant if you understand Kant well enough. But it is evident that part of the indifference of the public to scientific questions is due to poor presentation. When we can find writers who know their subject and are willing to devote as much attention to putting it in effective form as though it were a poem or short story there will be less reason to complain of lack of interest. Science Service will spare no pains or expense in the endeavor (1) to get the best possible quality of popular science writing and (2) to get it to the largest possible number of readers. If in doing this it can make both ends meet, so much the better. If not, it will do it anyway.

Through the generosity of Mr. E. W. Scripps, of Miramar, California, the Science Service has been assured of such financial support from the start as to insure its independence. It will not be under the control of any clique, class or commercial interest. It will not be the organ of any one association. It will serve all the sciences. It will supply any of the news syndicates. It will not indulge in propaganda unless it be propaganda to urge the value of research and the usefulness of science.

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Dr. W. E. Ritter is president of the board, Mr. R. P. Scripps, treasurer, and Dr. Vernon Kellogg, vice-president and chairman of the executive committee. This committee is composed of five members, one selected from each group of trustees from the different organi-

zations represented on the board. The present members of the committee are the president and vice-president of the board, Dr. J. McKeen Cattell and Dr. J. C. Merriam. A member from the journalistic group is yet to be selected.

The headquarters of Science Service have been provisionally established in the building of the National Research Council, at 1701 Massachusetts Avenue, Washington, D. C.

As editor the board of trustees has selected Edwin E. Slosson, Ph.D., who for twelve years was professor of chemistry in the University of Wyoming and for seventeen years literary editor of *The Independent*, New York. He has been associate in the Columbia School of Journalism since its foundation and is the author of "Creative Chemistry," "Easy Lessons in Einstein," "Great American Universities," "Major Prophets of To-day," lives of Rumford and Gibbs and other scientific and literary publications.

As manager of the new enterprise the board has selected Howard Wheeler, formerly editor of the San Francisco *Daily News*, Pacific coast manager of the Newspaper Enterprise Association, managing editor of *Harpers Weekly*, and for five years editor of *Everybody's Magazine*, war correspondent and author of "Are We Ready?"

The editor of Science Service desires to receive advance information of important researches approaching the point of publicity in order to arrange for their proper presentation in the press. He also wishes to secure correspondents in every university and center of research who have the time, disposition and ability to write for non-technical journals. He particularly wants to get in touch with young men and women in the various sciences who have literary inclinations and would be willing to submit to a rigorous course of training with a view to making the writing of popular science a part of their life work.

The manager wants to learn from newspapers and periodicals what sort of scientific news they need. If editors will notify Science Service by mail or telegraph whenever they want an article on any scientific subject, an effort will be made to find the best authority to write it.

EDWIN E. SLOSSON

THE DISTRIBUTION OF HOOKWORMS IN THE ZOOLOGICAL REGIONS

INCIDENTAL to the pursuit of some public-health problems in the Orient I observe what seems to me to be a peculiar zoological and geographical distribution of two species of hookworms which parasitize man, *Ancylostoma duodenale* and *Necator americanus* and I feel confident that a study of the distribution of these obligate parasites of man will throw some light on problems dealing with the migrations of races of mankind in the past as well as other problems in ethnology.

Ancylostoma duodenale and *Necator americanus* parasitize man with equal facility. It is as easy for a white man, Chinese, Polynesian, East Indian, Malay or Negro to become infected with *A. duodenale* as with *N. americanus* and they may become infected with either or both species of worm, but it was rather remarkable to find that just as the races of man were primarily distributed in Urasia, Africa and Oceania so there seems to have been a primary and distinctive distribution of *A. duodenale* and *N. americanus* for I found that Japanese, East Indians and Chinese from north of say twenty-three degrees north latitude, that is men of the Holarctic region, harbored a very marked predominance of *A. duodenale*. On the other hand southern East Indians, *i.e.*, Tamils and Malabaris say from south of twenty degrees north latitude as well as Malays from Sumatra, Borneo, the Malay Peninsula and Java, that is to say, men of the Oriental region, harbored a marked predominance of or were exclusively parasitized by *N. americanus*.

In studying the hookworm content of an uncontaminated group of Fijians, a mixed Polynesian and Melanesian stock, I found *A. duodenale* to be entirely absent. *N. americanus* and a few *A. ceylanicum*, picked up from dogs, represented the worms harbored.

In South Africa among Kaffirs from south of twenty-two degrees south latitude and among some tropical natives, that is to say

men from the Ethiopian region, *Necator* was the only hookworm encountered. The search was not an exhaustive one. Leiper and others, however, have recorded only *Necator* from this region.

I have not worked in Europe or northern Africa but Looss, Boycott and others report the exclusive presence of *A. duodenale* in England, western Europe, Italy and Egypt, that is to say in the European moiety of the Holarctic region.

The introduction of the negro, East Indian and Mediterranean peoples into America has obscured the picture here and research among isolated and uncontaminated Indian tribes has yet to be undertaken. This research will no doubt yield some interesting data, helpful possibly in tracing the origin of the Amerind populations; it may be possible to trace a relationship for them with Mongoloids from Holarctic or from Oriental regions.

While there is a sharply marked out regional distribution of the worms in certain areas, in others time has brought about some overlapping of the two species.

The absence of *Necator* from Europe indicates pretty positively that European soil has not been contaminated by a Negroid race from the Ethiopian region, that is Africa south of the Sahara desert. The absence of *A. duodenale* from secluded groups of mountain people in the Oriental and in Ethiopian regions is explained in a similar way. In mid-Java and in a few coast and river towns in Fiji, East Indians have brought in large numbers of *A. duodenale* within historic times.

The movements of negroes, Oriental and Mediterranean peoples are modifying the primitive worm-species-formula of non-migratory people, hence interpretations must be made from carefully selected surveys only.

It is held by some that man and his obligate parasites living in symbiosis have come along through the ages together, that the relationship has not been recently or casually acquired. If this be true we should expect to find man parasitized always by the two obligate forms and not to find man of the Holarctic regions parasitized exclusively or almost exclusively by *A. duodenale,* while man of the Oriental and Ethiopian regions parasitized exclusively or almost exclusively by *Necator americanus.* This finding in any case suggests the possibility of the distribution of the two species of worms in distinctly different zoologic as well as geographic regions being due to there having been two primitive races of man, each one originally parasitized by a particular species of worm. Certain it is that *N. americanus* is found more exclusively among black- and brown-skinned races, while *A. duodenale* is found exclusively or greatly predominates at the present time among Caucasian and Mongoloid stocks.

It may be that a Eurasiatic race of man, possibly the *Pithecanthropus* of Trinil, Java, became split off and furnished the stock from which man of Oriental and Ethiopian regions sprung. *Proliopithecus* emerging from Holarctic Africa may have been not only the parent form of man, gibbon, chimpanzee, gorilla and the orang-outang, but he may have harbored the parent form from which have arisen the different hookworm species found in the various species of anthropoids of today. Possibly the ancestral tree of the primates can be revised after a study of the host relationships of their respective obligate nematode parasites. At any rate we can say that it seems likely from the present distribution of *A. duodenale* and *N. americanus* as determined in surveys recently made of selected groups that there were originally races of man parasitized exclusively by *A. duodenale* and inhabiting the Holarctic region, that is Europe, Asia, north of the Oriental region and northern Africa; and that there were other races of man parasitized exclusively by *N. americanus* and inhabiting the Oriental region, that is the southern peninsulas of Asia and Indonesia or the Malay Archipelago; and also the Ethiopian region, that is, Africa south of the Sahara Desert.

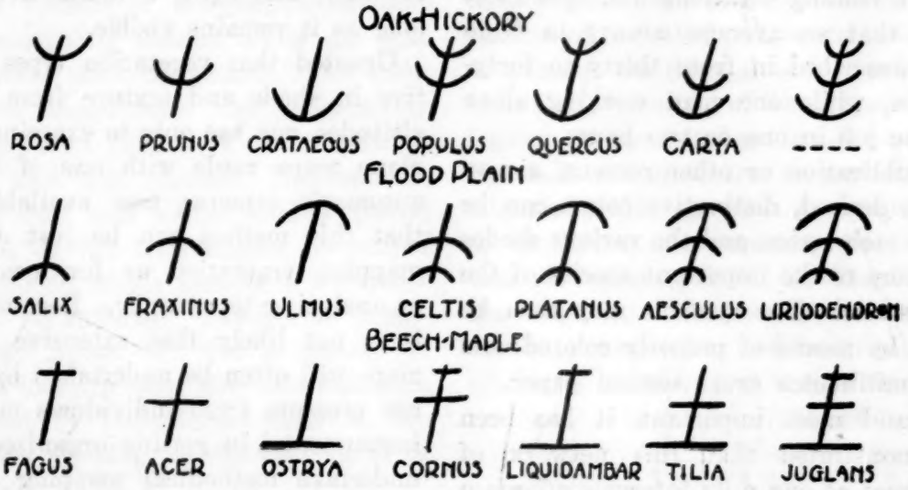
The subject is an enticing one to pursue but further deductions should probably not be hazarded at this time by one who is merely a peregrinating parasitologist.

Samuel T. Darling
International Health Board

VEGETATION MAPPING

THE value of accurate maps of native vegetation as a basis for very practical generalizations can not be questioned. It is obvious that an essential condition for getting accurate maps of large areas is the existence of precise maps of smaller component ones. At present very few precise local maps are available, but it is to be hoped that botanists throughout the country will begin to supplement the efforts of a few of their number who are doing map work of permanent and general value.

In original surveys of the forested states by government engineers the bearing trees at section corners were often listed by species, while field notes of transects present an orderly panorama of forest types passed through on each mile. The first Ohio surveys were generally done by trained woodsmen, and exhaustive field checks show that their specific determinations of trees may be



The workers who have contributed our various large area maps doubtless realize better than any one else the impressionistic nature of their final product. In most cases these men have done the utmost possible with scanty and vague local data. There have been, however, a few instances of buoyant disregard of the deadly principle of accumulation of error which ought not to have happened. One author, mapping a fairly large area, secured local data from a source whose authority few would care to question and then from his distant vantage point cut and trimmed until, speaking mildly, the accuracy of a considerable sector of his map was seriously impaired.

In preparing careful local maps of vegetation the question of procedure varies greatly, and is seldom an easy one. The two sources of help outlined below have been put to rather careful tests, and are presented not because of any imagined novelty but because they may prove useful to other workers under suitable conditions.

pretty generally relied upon. Happily, too, there have been few serious errors in running lines—certainly nothing like the gross blunders of some of the surveyors of a later day who worked in states farther west. When one considers the genuine hardships and dangers unconsciously revealed by the field notes covering the Connecticut Western Reserve (done before 1800), for example, the excellence of the work is remarkable.

A means of utilizing these notes has been worked out after some experiment, and combines economy of time with accuracy. A set of arbitrary generic symbols was devised which could be logically grouped and readily memorized. Three typical series of symbols are shown in the accompanying table. They consist of familiar units of penmanship and can be written without much effort, while their number can be increased to cover almost

any problem without a great deal of inventiveness. Where necessary to indicate species an initial following the symbol does very well.

Using these symbols the species of bearing trees at each section corner can be transcribed onto a sheet of cross section paper with one centimeter or quarter inch squares. Where correspondence between original and modern surveys is sufficiently close it is sometimes convenient to transcribe directly upon a county road map or topographic sheet, as this gives a ready guide for field checking. With an assistant reading locations and species it was found that an average county in Ohio could be transcribed in from thirty to forty-five minutes, while one man working alone could do the job in one or two hours.

If, for publication or other reasons, a map in colors is desired, distinctive colors can be assigned to each series, and the various shades of these colors to the important species of the respective series. The symbols may then be transcribed by means of properly colored dots upon two millimeter cross section paper.

Finally and most important, it has been amply demonstrated that this network of specimen trees at one mile intervals affords a *workable* map of native vegetation, even within an area twenty miles square. One concrete instance of the usefulness of such a map within the Erie Basin of Ohio may be cited. The climax forest of glaciated Ohio is beech-maple, but there are considerable areas whose native vegetation is oak-hickory and also prairie. The map in question revealed with great promptness a correlation whose significance the reader may judge for himself; the beech-maple covers what was upland during the recession of the postglacial lake, the oak-hickory coincides with the great shallow bays formed at various stages of recession, and prairie (with occasional bog centers) marks clearly the deeper baymouths. These facts of course become especially illuminating when taken in connection with the events of to-day, patent in and about Sandusky and Maumee bays.

II

While stationed at Dorr Field, Arcadia, Florida, in 1918, the writer had excellent opportunity to test the utility of the airplane as an aid in vegetation reconnaissance and mapping. It goes without saying that experience of this sort came as a by-product of other duties which fairly filled the time.

There are two basic facts to emphasize in connection with airplane reconnaissance—first, the tremendous increase in perspective made possible, and second, the fact that each type of vegetation preserves its distinctive shade of color, and often a distinctive texture, so long as it remains visible.

Granted that vegetation types are distinctive in shade and texture from considerable altitudes, one has only to examine mosaic airplane maps made with one of the excellent automatic cameras now available to realize that this method can be just as useful for mapping vegetation as for locating gunpits or analyzing topography. Because of the cost it is not likely that extensive photographic maps will often be undertaken by individuals, but pressure from individuals may be highly instrumental in getting organized agencies to undertake methodical mapping of this kind while native vegetation still remains.

For reconnaissance mapping, however, the airplane should be of great service to the individual. The ecologist who is engaged in studying a given region ought to pause to balance the time he will spend in planning and later in piecing together isolated field studies to get their broad interpretation *against* the expense involved in taking two thirty-minute flights over the region. A minimum of two flights has been suggested because the first would permit intelligent planning of field studies while the second, taken at the conclusion of these studies, would permit their proper synthesis and criticism. Since expense is not the only objection that is likely to arise, it may not be amiss to mention that straight flying is uniformly a delightful experience and that notetaking or even map sketching can be performed with ease inside of the cockpit.

The first flight in the Dorr Field region suggested clearly the essential relations between pine flatwoods, palmetto scrub, and prairie. These relations would have developed very slowly from field studies alone, as the forms of various areas were often misleading when viewed from ground level, and significant differences of contour were matters of inches rather than feet. From the air it seemed obvious that a key to the situation lay in the rainy season water levels. The prairies were observed to form a continuous system—the pathway of broad, shallow rainy season drainage lines—the palmetto scrub formed a fringing zone that might be occasionally flooded, while the pine flatwoods marked the true uplands. The truth of these first suggestions was conclusively fixed by subsequent field work and flights in both rainy and dry seasons. Incidentally, combined ground and aerial studies forced serious doubt of the true climax nature of the pine flatwoods, which seemed in a number of places to be suffering invasion by mesophytic dicotyl forest. It was a matter of some interest to learn later that this inference was borne out by unpublished data of two other botanists working on different parts of the peninsula.

PAUL B. SEARS

UNIVERSITY OF NEBRASKA

SCIENTIFIC EVENTS

THE SYSTEMATIZATION OF PLANKTON INVESTIGATIONS

THE following notice has just been received from Professor L. Joubin (Institut Océanographique, 195 Rue Saint-Jacques, Paris) the secretary of the subsection of biological oceanography of the International Union of Biological Sciences, International Research Council.

An international meeting of the delegates of the national sections was held at Paris on January 27, 1921, under the presidency of the Prince of Monaco. At this meeting it was agreed that the study of plankton is not progressing as well as might be desired, because the methods of investigation vary and therefore can not give comparable results. There is need for standardizing the fundamentals of these methods by means of the preparation of a manual which will systematize them while at the same time leaving to each investigator a free hand to perfect and to complete them. These improvements would be taken into consideration in future editions. A circular will be sent to all naturalists (zoologists, botanists, physiologists and chemists) and institutions interested and they will be requested to have it reprinted in the scientific journals and distributed among those interested in oceanography, as well as to solicit opinions, advice, criticism, and observations of any kind. A committee was named to prepare the manual and to bring the plan before the meeting of the subsection of biological oceanography in December, 1921. Specialists who desire to participate in the commission for plankton studies are requested so to inform the secretary. It is requested that all replies, printed matter, data concerning capture, instruments, fabrics, nets, reagents, preservation, and technical methods of all kinds be addressed to the secretary.

AUSTIN H. CLARK

MADAME CURIE'S VISIT TO AMERICA

(From a Correspondent)

MADAME MARIE CURIE, of Paris, the student of radium, will visit this country in May as a guest of the women of America. She will bring with her her two daughters, the elder of whom is also a scientist.

Madame Curie, internationally known for her studies on radium and its application as a remedial agent for cancer, is one of three unusually gifted daughters of a Polish educator. One of her sisters is principal of an important young women's school in Warsaw and the other is director of a large sanatorium in the Galician mountains. Madame Curie went to Paris from Warsaw as a young woman to study in the Sorbonne, and while in Paris married the brilliant physicist and student of radium, Professor Pierre Curie, who met a tragic death by accident in a Paris street in 1906. She is now a teacher in the Sorbonne

and an investigator in the Curie Radium Institute, to the support of which she has devoted the money received by her from the Nobel Prize award, as also the money received from other awards.

While in America Madame Curie will be given honorary degrees by several American universities and a medal by a leading scientific society. In addition a group of women in New York and Washington are trying to raise funds sufficient to purchase and present to her, as a gift from the women of America, a gram of radium for use in her experimental work in the Curie Radium Institute. When asked recently in Paris: "What would you most prefer to have in the world?" Madame Curie promptly replied "A gram of radium under my own control."

She has never possessed such an amount of radium for her independent use, nor can she ever afford from her own means to buy it. She lives on the modest stipend received by her for her teaching and research work in the Sorbonne and does not care for more money except to put it into the equipment and support of her laboratory.

If the beautiful idea of making to Madame Curie, on the occasion of her visit here, the gift of a gram of radium in recognition of her achievements in the interests of science and humanity, can be realized, it will be the most fitting and appreciated tribute that can be paid her.

The radium will cost about $100,000 and contributions, even small sums, are earnestly solicited. If sent to Mrs. Vernon Kellogg, 1701 Massachusetts Avenue, Washington, D. C., they will be receipted and properly accounted for.

THE ROCHESTER MEETING OF THE AMERICAN CHEMICAL SOCIETY

The spring meeting of the American Chemical Society will be held with the Rochester Section, Tuesday, April 26, to Friday, April 29, inclusive. A large and successful meeting is assured as many thousand members of the society are within a night's journey of Rochester and reduced railroad rates have been secured. A rate of one and one half fare for the round trip journey under the certificate plan has been granted. This is good from all parts of the United States, except New England, and west of Utah, the New England and Transcontinental Association having declined to give rates. The Rochester hotel is the headquarters.

The preliminary program is as follows:

Monday, April 25

4.00 P.M.—Council meeting, Rochester Club.

6.30 P.M.—Dinner to the council at the Rochester Club.

Tuesday, April 26

10.00 A.M.—General meeting, Chamber of Commerce.

Address of welcome, Hiram Edgerton, and W. Roy McCanne, president of the Rochester Chamber of Commerce.

Response, Edgar F. Smith, president of the American Chemical Society.

General addresses, by Senator James W. Wadsworth, Jr., and Congressman Nicholas Longworth.

2.00 P.M.—General meeting, Convention Hall.

Papers, by E. C. Franklin, C. E. K. Mees and others.

6.30 P.M.—College and Fraternity dinners.

Wednesday, April 27

9.00 A.M.—Divisional meetings, Mechanics Institute.

1.30 P.M.—Divisional meetings, Mechanics Institute.

8.00 P.M.—Public address, speaker to be announced.

Thursday, April 28

9.00 A.M.—Divisional meetings, Mechanics Institute.

Sigma Xi Luncheon—Hotel Rochester.

2.00 P.M.—Divisional meetings, Mechanics Institute.

3.00 P.M.—Meeting of chairman and secretaries of local sections.

7.00 P.M.—Good-Fellowship meeting, Bausch and Lomb's Dining Hall.

Friday, April 29

8.30 A.M.—Excursions.

The following are the addresses of the divisional and sectional secretaries.

Divisions:

Agricultural and Food Chemistry: T. J. Bryan, 4100 Filmore Street, Chicago, Ill.

Biological Chemistry: H. B. Lewis, University of Illinois, Urbana, Ill.

Dye Chemistry: R. Norris Shreve, 43 Fifth Avenue, New York, N. Y.

Industrial and Engineering Chemistry: H. E. Howe, 1701 Massachusetts Avenue, N.W., Washington, D. C.

Organic Chemistry: H. T. Clarke, Kodak Park, Rochester, N. Y.

Chemistry of Medicinal Products: Edgar B. Carter, 2615 Ashland Avenue, Indianapolis, Ind.

Physical and Inorganic Chemistry: S. E. Sheppard, 83 Gorsline Street, Rochester, N. Y.

Rubber Chemistry: Arnold H. Smith, Thermoid Rubber Company, Trenton, N. J.

Water Sewage and Sanitation Chemistry: W. W. Skinner, Bureau of Chemistry, Washington, D. C.

Sections:

Sugar Chemistry: Frederick J. Bates, Bureau of Standards, Washington, D. C.

Cellulose Chemistry: G. J. Esselen, Jr., 248 Boylston Street, Boston, Mass.

Petroleum Chemistry: W. A. Gruse, Mellon Institute, Pittsburgh, Pa.

The final program will be sent about April 20 to the secretaries of sections, to the council, to members of the Rochester Section, and to all members making special request.

CHARLES L. PARSONS,
Secretary

THE HERTER LECTURESHIP

IN November, 1902, Dr. and Mrs. Christian A. Herter, of New York, gave to the Johns Hopkins University the sum of $25,000 "for the formation of a memorial lectureship designed to promote a more intimate knowledge of the researches of foreign investigators in the realm of medical science." According to the terms of the gift, some eminent worker in physiology or pathology is to be asked each year to deliver a lecture at the Johns Hopkins University upon a subject with which he has been identified.

The selection of the lecturer is made by a committee representing the departments of pathology, physiological chemistry, and clinical medicine, and if "in the judgment of the committee it should ultimately appear desirable to open the proposed lectureship to leaders in medical research in this country there should be no bar to so doing." The committee consists of Drs. MacCallum, Abel and Thayer.

The trustees of the Johns Hopkins University announce that the twelfth course of lectures on this foundation will be given by Dr. Frederick Gowland Hopkins, F.R.S., professor of bio-chemistry and director of the bio-chemical laboratory, Cambridge University. The lectures will be given in the Johns Hopkins Hospital, at 4.30 P.M. on April 12, 13 and 14, the subjects being: (1) "Oxidation and reduction mechanisms in living tissues," (2) "The function of oxygen in muscular activity," and (3) "The outlook in nutritional studies: an appraisement."

SCIENTIFIC NOTES AND NEWS

DR. ALBERT EINSTEIN, of the University of Berlin, arrived in the United States on April 2, coming in order to advance the Zionist movement, and the establishment of a University at Jerusalem. Dr. Einstein was accompanied by three other delegates, including Professor Charles Weizmann, who was head of the British Admiralty Chemical Laboratories during the war. There will be a Zionist meeting at the Metropolitan Opera House on April 10. Dr. Einstein's arrival was unexpected and no announcements have been made of scientific lectures.

THE Albert medal of the Royal Society of Arts was presented on March 14 to Professor Albert Michelson, for his discovery of a natural constant which has provided a basis for a standard of length. The award was made last year, but the actual presentation was deferred until Professor Michelson could go to England to receive it.

DAVID CHARLES DAVIES has been appointed director of the Field Museum, Chicago, to

succeed Dr. Frederick Skiff. Mr. Davies has been connected with the museum for twenty-seven years, and, as assistant to Dr. Skiff, superintended the moving of the museum exhibits from the building in Jackson Park to the new quarters in Grant Park. The museum will be opened to the public on May 3.

President Harding has reappointed Colonel E. Lester Jones to continue as head of the Bureau of Coast and Geodetic Survey, and the appointment has been confirmed by the senate.

Mr. Thomas Robertson, of the patent law firm of Robertson & Johnson, Washington, has been appointed commissioner of patents.

Surgeon John D. Long, who for the last two years has been supervisor of the U. S. Public Health Service in San Francisco, has been transferred to the office of Surgeon-General, in Washington.

A dinner of congratulation to Professor Sherrington on his election to the presidency of the Royal Society was given by the Physiological Society on March 11, at the Café Royal, London. Professor Sir E. Sharpey-Schafer proposed the toast of the guest and Professor Sherrington replied.

In recognition of the knighthood conferred upon him by the king, Sir Dawson Williams, editor of the *British Medical Journal*, was entertained by the council of the British Medcal Association at a complimentary luncheon on February 16.

Professor Douglas Johnson, of Columbia University, has been awarded the Janssen Medal by the Geographical Society of Paris, for his recent work on "Shore processes and shoreline development." This medal was founded in 1896 by the astronomer, J. Janssen, to encourage precision in the making of scientific observations, and is awarded each year "to the author or explorer who shall have made the largest number of consistent scientific observations."

Dr. Reid Hunt, professor of pharmacology in the Harvard Medical School, has been appointed by the Surgeon-General of the United States Public Health Service, a member of the advisory board of the Hygienic Laboratory to succeed the late Dr. W. T. Sedgwick.

The thirty-seventh session of the American Association of Anatomists was held at The Wistar Institute of Anatomy and Biology, Philadelphia, on March 24, 25 and 26. Dr. S. Walter Ranson, Northwestern University, and Dr. Robert J. Terry, Washington University, were elected members of the executive committee. The editorial boards of the two anatomical journals were reorganized. Dr. Charles R. Stockard, of Cornell University, was selected as managing editor of *The American Journal of Anatomy*, and Dr. John Lewis Bremer, of Harvard University, was made managing editor of *The Anatomical Record*.

A conference was held on March 25, of physicians summoned by Brigadier-General Charles E. Sawyer, President Harding's personal physician, to discuss with the president proposed plans for reorganization. Those attending the meeting were Surgeon-General Cumming, U. S. P. H. S.; Surgeon-General M. W. Ireland, of the Army; Surgeon-General E. R. Stitt, of the Navy; Dr. Charles H. Mayo, Rochester, Minn.; Dr. Edward Martin, Pennsylvania commissioner of health, and Dr. William F. Snow, New York, American Social Hygiene Association. General Sawyer said the discussion was a preliminary one to action for uniting government health units. An advisory council was formed, consisting of the Surgeon-Generals of the Army, Navy and Public Health Service and Dr. Mayo. Two other members will be added to the council, one an educator and the other a woman engaged in public welfare work.

The joint committee of the Royal Geographical Society and the Alpine Club have now completed the appointments to the reconnaissance of Mount Everest. The expedition is constituted as follows: Chief of the expedition: Colonel Howard Bury; mountaineers: Mr. Harold Raeburn (leader), Dr. A. M. Kellas, Mr. G. L. Mallory, Mr. George Finch; medical officer and naturalist: Mr. A. F. R. Wollaston. The surveyor-general of India telegraphs that, subject to the consent of the

government of India, the following officers of the Survey of India will accompany the expedition: Major H. T. Morshead and Captain Wheeler. The expedition will assemble at Darjeeling about May 10.

MISS E. M. WAKEFIELD, F.L.S., mycologist, Royal Botanical Gardens, Kew, England, is visiting the eastern United States and Canada on her way home from the British West Indies. She was the guest of honor at a dinner given by the women mycologists and pathologists of the U. S. Department of Agriculture on March 23.

DR. CHARLES A. KOFOID, of the University of California, delivered on March 29, at the Cleveland Medical Library, the third Hanna lecture on "The clinical and medical significance of parasitic infections of the human intestine with especial reference to hookworm, amebic and flagellate infections."

AT a joint meeting of the Washington Academy of Sciences and the Biological Society of Washington on April 2, Dr. A. D. Hopkins, U. S. Bureau of Entomology, delivered an address on "International problems in natural and artificial distribution of plants and animals."

PROFESSOR WILLIAM DUANE, head of the department of bio-physics at the Harvard Medical School, gave on March 31 the first of three lectures open to the public at the Jefferson Physical Laboratory. Professor Duane spoke on "Radio Activity and X-rays."

DR. GEORGE E. VINCENT, president of the Rockefeller Foundation, recently delivered the second of the Marshall Woods lectures at Brown University, his subject being "The university and public health."

THE annual meeting of the Wisconsin Academy of Sciences, Arts and Letters will be held at the University of Wisconsin on April 15 and 16. President E. A. Birge will deliver his presidential address at an informal diner for members of the academy and their friends to be held on Saturday evening, April 16.

JOHN BURROUGHS, the distinguished naturalist, died on March 29, aged eighty-four years.

DR. DELOS FALL, formerly of the faculty of Albion College and for forty-one years head of the department of chemistry of that institute, died at Bradentown, Florida, on February 19.

IT is announced that the 20-inch lens for the telescope at Van Vleck Observatory of Wesleyan University has been delivered. The lens was ordered in 1914 from Jena, a few days before war was declared.

THROUGH the gift of Miss Annie M. Alexander who has pledged more than $8,000 annually for a period of years, the University of California has been enabled to organize a Museum of Palæontology. Effected primarily for the advancement of research in palæontology and historical geology, it is expected that the investigators on the fossil mammals and fossil reptiles of the Pacific coast, begun by President John Campbell Merriam, of the Carnegie Institution of Washington, formerly professor of palæontology and historical geology and dean of the faculties, will be continued in the new department. Dr. Bruce L. Clark, assistant professor of palæontology, has been named director of the museum, while E. L. Furlong, assistant in palæontology, is expected to be appointed curator of the vertebrate collections. Included in the staff will be Chester Stock, instructor in palæontology, and Mr. Charles Camp, to be named vertebrate palæontologists. Comprising thousands of specimens of fossil plants, vertebrates and invertebrates, the present collections will be turned over to the museum, and the department of palæontology will cease to have a separate existence. Proper organization of this and other collections is stated to be one of the most important purposes for which the museum has been founded.

THE museum of natural history of the University of Illinois has recently acquired the collection of mollusks made by the late Anson A. Hinkley, of Du Bois, Illinois. It contains upwards of 200,000 specimens, including the types or cotypes of 113 new species and five new

genera and subgenera. It is rich in the little-known regions of Alabama and other places in the southern states, and contains extensive material from Guatemala, Venezuela, Mexico, and other parts of Central and South America. Mr. Hinkley was a careful collector and the material includes valuable data as to place and habitat. It is the most valuable scientific collection received by the university in many years. The estate of the late Dr. W. A. Nason, of Algonquin, Ill., has presented Dr. Nason's collections to the museum. These consist of about 50,000 insects, mostly American and largely Illinois, 10,000 land, fresh water, and marine mollusks, and about 2,000 plants.

Syracuse University has come into possession, by gift, of the personal herbarium of Gertrude Norton, a native of Syracuse, and a former student in Syracuse University. Miss Norton taught for some years in Salt Lake City, Utah, where she died in 1919. This herbarium embraces a collection of about one thousand specimens of the rare or more characteristic plants of Utah and of the Flathead region of Montana.

The state of Illinois has printed for the Natural History Survey of the state a second edition of a report by S. A. Forbes and R. E. Richardson on the fishes of Illinois, the original edition, published in 1908, having been out of print for several years. This report contains an account of the topography and hydrography of Illinois, a chapter on the distribution of Illinois fishes within the state and throughout the country, and full descriptions and many illustrations of the 150 species of fishes found in Illinois, with accounts of their distribution, habits, food, and uses so far as these are known. It is illustrated by 76 black and white figures and colored plates of 68 species. The main report of 492 pages is accompanied by an atlas of 102 maps of the state showing its stream systems, its glacial geology, the localities from which collections of fishes have been made by the Natural History Survey, and those from which each of the 98 more abundant species has been taken. A limited number of the edition is reserved for free distribution to libraries, educational institutions and specialists who have not received the first edition, and the remainder are offered in single copies to institutions and individuals at the cost of the reprint.

The death of Dr. John Iridelle Dillard Hinds is announced, at the age of seventy-three years. Dr. Hinds was one of the founders of the American Chemical Society. He was born in North Carolina, educated in the preparatory schools of Arkansas, was for over forty years professor of chemistry in Cumberland University, the University of Nashville and Peabody College. At the time of his death he was chemist for the Geological Survey of Tennessee.

UNIVERSITY AND EDUCATIONAL NEWS

Dr. Ernest Fox Nichols, for the past year director of physical research at the Nela Park Laboratory, Cleveland, recently professor of physics at Colgate, Dartmouth, Columbia and Yale and president of Dartmouth College, has been elected president of the Massachusetts Institute of Technology, to succeed the late Richard C. Maclaurin.

George Hoyt Whipple, director of the Hooper Foundation at the University of California, has been appointed dean of the school of medicine, dentistry and surgery of the University of Rochester.

Professor George H. Parker has been appointed director of the Harvard Zoological Laboratory to succeed Professor E. L. Mark, who will retire from active teaching at the close of the current year with the title of professor emeritus, after having spent forty-four years in the service of the university. The new director, Professor Parker, has been associated with Harvard University since his graduation in 1887, and has held a full professorship of zoology since 1906.

Dr. Olof Larsell, associate professor of zoology at Northwestern University, has ac-

cepted the position of professor of anatomy in the medical school of the University of Oregon.

DISCUSSION AND CORRESPONDENCE

OSTEOMYELITIS IN THE PERMIAN

IT is always an interesting matter to be able to call attention to the earliest appearance in geological time of any phenomenon of nature which is common at the present time. It is especially important in ancient pathology to point out the similarity in form of the results of infective processes of ancient times with those of recent epochs. It is evident that the results of pathological processes have undergone no particular evolutionary change and one untrained in the study of fossil objects is able to recognize an example of osteomyelitis from the Permian if he is acquainted with modern pathology.

The present specimen which shows this interesting phase of pathology is a posterior dorsal spine of a reptile of the *Dimetrodon* type and was collected in the Red Beds of Texas by Mr. Paul C. Miller, of the University of Chicago. The spine had been fractured near its base in a simple transverse break, the line of which is still evident, and from an ensuing infection a chronic osteomyelitis developed in the shaft of the bone producing a sinus-filled tumefaction which is to-day so characteristic of that condition. This argues for the presence of infective bacteria during the Permian such as have been demonstrated by the magnificent researches of Renault in the Paleozoic of France.

This is the oldest vertebrate fossil showing the results of infection which has been seen or described, as it is likewise the oldest example of osteomyelitis. These statements apply only to fossil vertebrates for I have not sufficient knowledge of invertebrate forms to make a sweeping statement covering all fossil forms, but so far as my studies go I have seen no example of bacterial infection during the life of any Paleozoic form older than the reptile referred to above. This of course brings up the question as to the existence of a very mild form of pathology during the early geological periods. The entire problem of early pathology is, however, still an open one and hasty conclusions must not be made on insufficient data.

ROY L. MOODIE
DEPARTMENT OF ANATOMY,
UNIVERSITY OF ILLINOIS,
CHICAGO

THE CHROMOSOMES OF CONOCEPHALUM CONICUM

DURING the winter and spring of 1919-20 a study was made of the chromosomes of *Conocephalum conicum* for the purpose of determining whether or not there exists any visible difference between the chromosome groups of the two sexes. No such difference was found, but the chromosome number (haploid) is plainly nine instead of eight as reported by Farmer, Bolleter, and Escoyez. One of the chromosomes is very minute and may have been overlooked by these workers, or there may possibly be a difference in respect to the chromosome number between the European and the American races which are ascribed to this species. It is planned to secure plants from different localities and continue the study with reference to the chromosome number.

AMOS M. SHOWALTER
DEPARTMENT OF BOTANY,
UNIVERSITY OF WISCONSIN

THE COST OF GERMAN PUBLICATIONS

TO THE EDITOR OF SCIENCE: Concerning this topic I may be allowed, as one not long ago from a neutral country, to answer Mr. Howe's and Mr. Dock's letters (SCIENCE, Nov. 26, 1920, and Dec. 24, 1920, resp.) as follows:

When, before the war, the Germans sold goods to this country at a lower price than they were sold in Germany, this fact was much resented here.

When nowadays, after the war, the Germans sell goods to this country at a higher price, nominally, than they are sold in Germany, this fact is much resented here again.

Note the inconsistency!

If German books could be imported into this country at prices prevailing in Germany

the result, most probably, would be that the American publishers would urge Congress to put high import-duties on them, as has been the case with scientific instruments. Or else, another group of people would get alarmed at the flood of German literature coming into the country and would interpret it as a revival of German propaganda.

In either case it is easy to conjecture as to who is finally to become the loser. There is no doubt but that in either case the scientist will suffer the most, the broad-gauge scientist who holds the view that science has no political limits or national boundaries.

Only a week or so ago I received a letter from my German book-dealer, a prominent publisher, by the way, who has from the start strongly opposed the placing of any surtax, whatsoever, on the export of German books and publications. He informed me that at last the German government has urged the "Börsenverein des deutschen Buchhandels" (the central organization that controls the price of books in Germany and abroad) to lower its export-tax (Valuta-zuschlag). The suggestion was acted upon favorably by this organization and as a result the tax has been lowered and fixed, for the time being, at 200 per cent. above the current price in Germany. To all appearances this percentage is not likely to go any higher since the rate of exchange, which has so far determined the surtax, has an upward trend. *Even at the present rate a German book would cost much less in this country than before the war.*

Before one may pass judgment on the cases that seem discriminatory to the disadvantage of the foreign buyer in favor of the German, one should consider the fact that nowadays and for a long time to come, the outlay for a book of say 60 marks entails a much greater sacrifice for the German scientist than three times or even five times that amount in German marks to the scientist in America.

It is the principle of "Relativity" that should guide us more in our judgments if they are to be unbiased.

The German publisher to whom I have referred, Dr. W. Engelmann of Leipzig, has likewise informed me that he, at least, has abolished all foreign surtaxes on journals published by his firm. (It is a matter of regret to him that he is not (yet?) at liberty, owing to the binding regulations of the "Börsenverein" to do the same with his own books.) Nevertheless he finds it hard to get as few as 150 subscriptions to some of his publications, a modest figure indeed, the attainment of which is necessary to continue the publication of such invaluable periodicals as the *Zeitschrift für wissenschaftliche Zoologie;* Groth's *Zeitschrift für Kristallographie und Mineralogie,* (now under the editorship of the eminent Swiss mineralogist, Professor P. Niggli, of Zürich); the *Botanische Jahrbücher;* and others. Two or three dollars in German money now enables an American scientist to take out a personal subscription for a whole year. I trust an appeal to internationally minded scientists and others is not out of place here. Subscriptions for foreign periodicals are needed and are most timely at the present writing in that they will help over times of difficulties such highly important journals of international scope as have been mentioned. Such an aid now is sure to benefit all parties concerned, both immediately and in the future.

In conclusion I may add that another scientific journal of high worth must receive financial support, either through subscriptions or voluntary gifts, if it is to be saved from permanent suspension. I am this time referring to a publication devoted to soils, namely the *International Review of Pedology* or, as it is designated abroad in French and in German respectively: *Revue internationale de pédologie* and *Internationale Mitteilungen für Bodenkunde.* A group of Dutch agricultural chemists have taken steps to insure the continuation of that publication and voluntary gifts and subscriptions are solicited. Correspondence should be addressed to Dr. D. J. Hissink, in care of the Agricultural Experiment Station, Groningen, Holland.

M. W. Senstius

Syracuse University

THE COST OF AMERICAN PUBLICATIONS IN ROUMANIA

TO THE EDITOR OF SCIENCE: Foreseeing the high soar of science in the United States and desiring to be acquainted with the scientific events in that country and to pursue the activity of my numerous American friends and acquaintances, I have been for twenty years a subscriber to SCIENCE.

In December last, I renewed my subscription of seven dollars, which cost now in Roumanian money 595 lei instead of 35 lei in 1914.

In the university library of Cluj, otherwise well furnished, and in the libraries of the various institutes, the American publications are almost completely wanting; in the laboratories and clinics of our university there is no instrument or apparatus of American fabrication. The Hungarian administration, that had governed this university until 1919, had not yet discovered America.

The leaders and professors of the actual Roumanian University are very desirous to acquire the American books and periodicals; they would like to make use of the best instruments and apparatus constructed in the United States. They can not conceive that a modern and progressive university, as theirs, should lack the intellectual and technical cooperation of the American science.

But a microtome "Spencer" cost me 15,000 lei and a binocular "Spencer" 12,000 lei, to which must be added the transport and insurance expenses, etc.

There is no scientific institute that could afford such an expenditure, and no Roumanian institution can make "scientific purchases" in the United States as long as the dollar is worth 90 lei.

I take leave to draw the attention of the readers of your journal to this sad result of the world's war and to ask them if there might not be found any means to cure this evil, which is detrimental to both our nations.

I have great hopes that from the American practical spirit and high love of science will spring the best solution of this great difficulty and therefore I beg the editor of SCIENCE to open its columns to the study of that question.

I am at the disposal of the readers of SCIENCE who would desire any explanation about our university and who would like to transmit us directly their ideas or propositions.

E. G. RACOVITZA,
University professor, director of the Institute of Speology
UNIVERSITY OF CLUJ,
ROUMANIA

REQUESTS FOR BIOLOGICAL PUBLICATIONS

PROFESSOR CARL J. CORI has resumed his academic relations with the German university at Prague, Czecho-Slovak republic, in consequence of the transfer of the Marine Biological Station at Trieste, of which he was formerly director, from Austrian to Italian control. He desires to receive reprints and other biological works, especially those published since the outbreak of the war, which American biologists may wish to send him, at the Zoological Institute of the German university at Prague.

CHARLES A. KOFOID

SCIENTIFIC BOOKS

Root Development in the Grassland Formation, a Correlation of the Root Systems of Native Vegetation and Crop Plants. By JOHN E. WEAVER. Carnegie Inst. Washington Publ. 292. 18 × 26 cm., 151 pp., 25 pl., 39 text fig. Washington, 1920.

Students of plant physiology, ecology, agriculture and forestry, when they have taken occasion to survey the general field in which their own particular interests lay, must often have been greatly impressed with the extreme paucity of our knowledge of plant roots. Plant species have been described and redescribed, typical individuals have been photographed and painted, and thousands of pages in our libraries are devoted to the results of these descriptive studies and to their theoretical interpretation—but the far greater part of our accumulated knowledge of higher plants is closely confined to those portions of the plants that are readily seen and may be

easily examined. Until very recently no attempts have been made to extend observation and description to the subterranean parts of land plants, but excellent beginnings in this recondite province of botany are now available and enough has been accomplished to demonstrate that a well-rounded knowledge of plants or of any plant individual must include just as thorough study of root systems as has been devoted to the aerial parts.

Publication No. 292 of the Carnegie Institution of Washington is perhaps the most valuable contribution yet available in this new field. In this book Weaver presents the results of an enormous amount of detailed study devoted to the form and distribution of the roots of plants growing in the grasslands of the United States, this study being a continuation of the author's earlier volume on "The Ecological Relations of Roots." "Practically all of the grassland dominants have now been studied, many of them in two or more associations and under widely different conditions of environment." Descriptions of 38 new root systems of native plants are here presented and "more than 80 examinations of the root systems of crop plants have been made in widely varying soil types and conditions of growth." The root systems have been excavated with painstaking care and their form and distribution are set forth by descriptions and by diagrams drawn to scale, being frequently also illustrated by reproductions of photographs.

The point of view is primarily that of what may be called the Nebraska school of ecology. with much emphasis on the concept of plant succession and on the practical value of a knowledge of native vegetation as an indicator of agricultural possibilities.

> The phenomena of plant succession, whether ecesis, competition, or reaction, are controlled so largely by edaphic conditions and particularly by water-content [of the soil] that they can be properly interpreted and their true significance understood only from a thorough knowledge of root relations.

But the discussions involve much of the physiological, and the author's aim appears generally to be a consideration of the individual plant as a machine operating under the controlling conditions of the surroundings, both above and below the soil surface.

Since the work of charting root systems is very arduous and since the physiological processes of agricultural plants deserve attention before native plants are to be thoroughly studied in this way, it is especially gratifying that a goodly number of crop plants have received attention at the author's hands. Some striking points are shown by the following illustrations (from p. 139): Sweet clover (*Melilotus*) 116 days old had tops 1.8 ft. high and roots about 5 ft. deep in lowland soil, while the tops were only 1.5 ft. high and the roots were mainly about 5.8 ft. deep in upland soil. Oats (*Avena*) 75 days old had tops 3 ft. high in lowland and 2 ft. high in upland soil, the corresponding "working depths" of the roots being 2.6 and 3.1 ft., respectively.

The presentation of the results of these valuable investigations might rather easily have been rendered more generally clear and more readily comparable with the results of other similar studies, if the author had employed a meter-stick instead of his foot-rule. He does not appear to be consistently opposed to the use of the metric system, for some measurements are recorded in millimeters, etc., and he has grafted the decimal characteristic of the better system on to the unit of the worse; he dealt primarily with feet and inches but reduced his final values to terms of the foot and its decimal fractions.

The root characteristics of a given species are found to be "often as marked and distinctive as are those of the aerial vegetative parts," in spite of profound differences frequently concomitant with marked differences in habitat conditions. Different species of the same genus are sometimes markedly different in their root characteristics.

The volume should be familiar to all who are interested in the relations that obtain between plants, on the one hand, and the soil and air conditions of their surroundings, on the other.

B. E. Livingston

NOTES ON METEOROLOGY AND CLIMATOLOGY

PHYSIOLOGICAL METEOROLOGY

IN opening his presidential address[1] before the American Meteorological Society at Chicago in December, Professor Robert DeC. Ward directed attention to the fact that the Constitution of the Society states as its first object "the advancement and diffusion of knowledge of meteorology, including climatology, and the development of its application to public health . . . ." He said further that, in spite of the intimate relations existing between meteorology and health, there are few physicians who have even an elementary training in meteorology, and perhaps fewer meteorologists who are competent to deal with the physiological and medical relations. It appears, however, that more and more thought is being given the subject, both at home and abroad; and this interest is finding its expression in various researches and numerous papers, these, in turn, being applied practically in the control of air conditions in hospitals,[2] factories,[3] and, in fact, in many other places where human health and mechanical efficiency must be maintained at their best.

Numerous papers bearing upon the subject of physiological meteorology have been published from time to time in the *Monthly Weather Review*, and among the most important of these is one by Dr. Leonard Hill of Essex, England, on "Atmospheric environment and health."[4] Says Dr. Hill:

> The body is fashioned by nature for the getting of food by active exercise, and upon the taking of such exercise depends the proper vigorous function of the digestive, respiratory and vascular organs. Consequent on this, too, is the vigor of the nervous system and keen enjoyment of life. So, too, the healthy state of joints, muscles and ligaments, and freedom from rheumatic pains depend upon proper exercise of the body, neither over use nor under use, either of which may be associated with malnutrition and lowered resistance to infection. The hothouse conditions of life suitable for the failing powers of the aged, the injured in a state of shock and those in the last stages of wasting disease are mistakenly supposed to be suitable for the young and healthy. The traditional fear of cold is handed down from mother to children at her knee. For fear of their "catching cold," they are confined indoors and overclothed. They are debilitated and exposed at the same time to massive infection in crowded places. They require well-chosen food containing all those vitamines or principles of growth which are found in milk, the young green shoots of plants, grain foods with the germ and outer layers not removed by the miller. At the same time they require the stimulation of abundant open-air exercise to make them eat and metabolize their food. Household expenses will go up as more food is eaten by children excited by open-air exercise to keen appetite, but an immense national economy will result from a healthy, vigorous, efficient people.

But to obtain quantitative measures of the meteorological conditions most closely related to bodily comfort and health (these conditions being temperature, vapor-pressure, and velocity of air movement), recourse must be had to other devices than the familiar wet- and dry-bulb thermometers. The thermometer, Dr. Hill points out, is a static instrument, while the body is dynamic, since heat is produced at a certain rate and must be lost at an equal rate. To meet this need, Dr. Hill, in 1913, devised the *katathermometer*, which has given excellent results. The katathermometer[5] consists of "a large-bulbed spirit thermometer of standard size and shape, graduated between 100° F. and 95° F. The

[1] "Climate and Health, with Special Reference to the United States." Author's abstract in *Monthly Weather Review*, December, 1920, pp. 690–691. Published in *The Scientific Monthly*, April, 1921.

[2] See Huntington, Ellsworth, "The Importance of Air Control in Hospitals," *The Modern Hospital*, April and May, 1920, pp. 271–275 and 348–353; noted in *Monthly Weather Review*, May, 1920, pp. 279–280.

[3] Mount, Harry A., "Making Weather to Order," *Scientific American*, March 5, 1921, pp. 188 and 198.

[4] December, 1920, pp. 687–690.

[5] *Cf.* Jacob, Robert A., "The Katathermometer: An Instrument to Measure Bodily Comfort," *Monthly Weather Review*, September, 1920, pp. 497–498, for history, description and photographs of the katathermometer.

bulb is heated in hot water in a thermos flask until the meniscus rises into the small top of the bulb. It is then dried, suspended and the time of cooling from 100° to 95° F. taken with a stop watch in seconds. The number of seconds, divided into a factor number (approximately 500, and determined for each instrument) gives the cooling power by convection and radiation on the surface of the "kata" at approximately skin temperature in millicalories per square centimeter per second. The operation is repeated with a cotton muslin finger stall on the bulb and the wet "kata" cooling power obtained, a cooling power due to evaporation, radiation and convection. The difference between the two readings gives the cooling power of the evaporation alone.

It is shown by a table to what low values the cooling power can fall in stagnant air at even moderate temperatures—values that are much too low for any except the most sedentary occupations. And yet it is true that in many factories and mills where great heat is generated by rapidly moving machinery, or where workmen are subjected to high temperatures in engine rooms and about furnaces, no provision is made for the introduction of cool air, nor even for keeping the warm air in circulation. The result is that the proper vigorous activity of the respiratory and vascular organs is not maintained and illness, or general depression, with its consequent inefficiency results. An excellent example of the effect of providing proper means for cooling is that of a large steel tube factory in England, where air ducts supply air so cool that the men working before the huge furnaces actually feel cool when the furnace doors are shut. The effect is quite like the heating and cooling on a summer's day with passing clouds. It is said that the output of that factory is greater than that of any other of its kind, and there is no industrial unrest. Thus it is, that by reproducing as far as possible within doors the slight variations of temperature and air movement which outdoor workers experience, it is possible to make some progress in keeping the sedentary worker in the same robust and vigorous physical condition in which the outdoor worker finds himself. The economic importance of giving attention to these considerations is obvious.

A study of the relations between weather conditions and the incidence of certain diseases in north Atlantic states has been made by Mr. John R. Weeks, U. S. Weather Bureau meteorologist at Binghamton, N. Y.[6] From his studies he has drawn the following conclusions:

First, that a moderate degree of humidity, about 70 per cent., and a moderate temperature, about 68° F., should be maintained in dwellings;

Second, that crowding and mingling with persons having cough should be avoided;

Third, that sunshine and plenty of interior light should be sought; and

Fourth, that schools for janitors should be provided in order that the heating and ventilation of public places may be properly cared for.

The objection that a relative humidity as high as 70 per cent. indoors in winter would be difficult to maintain with a temperature as high as 68° F. is, no doubt, a valid one; but such a temperature would probably be too high for comfort with that humidity. Since it would be much easier to maintain a high humidity with a lower temperature it probably would be possible to find a practicable combination of temperature and humidity which would be entirely comfortable. In an article by William E. Watt, principal of the Graham Public School, Chicago, on "How I run my school,"[7] it is found that a temperature of 60° F. is sufficiently high for comfort if sufficient humidity is maintained. By introducing live steam into his warm air ducts he found it possible to maintain such conditions, with beneficial results to teachers and pupils.

In addition to the necessity for local con-

[6] Abstract and discussion in *Bulletin of the American Meteorological Society*, February, 1921, pp. 27–28.

[7] *The Ladies' Home Journal*, September 1, 1910, p. 20.

siderations of atmospheric conditions and health, there are the broader and more general aspects of climate and the treatment of certain diseases. Professor Ward, in the address earlier referred to, emphasized the correct understanding of the characteristics of climate and the judicious selection of climates to suit the particular ailments, for there is no "perfect" climate that will be equally beneficial for all ills.

Efforts have been made frequently to give graphical representations of climatic characteristics, especially with regard to temperature and humidity, and some of these have been very successful. Perhaps the *climograph* of Dr. Griffith Taylor, of Australia, is the most noteworthy example. Mr. B. M. Varney[8] says:

> One scarcely need point out the great usefulness, to the geographer, the business man, the physician, the teacher, any device which helps to create living conceptions of the nature of climate and weather, so leading to a better estimate of the effect of a given atmospheric environment on human affairs.

That is what the climograph seeks to do. It is a chart in which wet-bulb temperatures are plotted against relative humidity, or air temperature (dry-bulb) against relative humidity. Mr. Varney has chosen to mark certain regions of his climographs "raw," "keen," "scorching," "muggy," etc., to indicate bodily sensation. The line joining the points in the diagram wanders about among these regions and thus indicates the characteristics of the weather or climate under consideration.

Dr. Carrol E. Edson, president of the American Climatological and Clinical Association, at the meeting of the Meteorological Society mentioned above, gave the following questions as being worthy of study by the meteorologist, and referred to them as gaps in present medical knowledge:

1. Is basic metabolism different in people living at high altitudes from that of people living at low altitudes? A study of this might be called "Climatic physiology."

2. What is the effect of sudden changes—changes of altitude, temperature, moisture, wind, etc.? Experimental solution of this question is possible. This is "Physiologic meteorology."

3. Lastly, there is the study of the adaptability of the diseased mechanism to meet sudden changes: "Medical climatology."

These are a few of the aspects of the relations between meteorology and health, and indicate what an extensive field there is for investigation, both for the meteorologist and the physician.

C. LEROY MEISINGER
WASHINGTON, D. C.

[8] "Some Further Uses of the Climograph," *Monthly Weather Review*, September, 1920, pp. 495–497.

SPECIAL ARTICLES

A NEW TYPE OF INHERITANCE

IN a recent contribution from the Carlsberg Laboratory,[1] J. Schmidt has described a new type of inheritance found in "the millions fish," *Lebistes reticulatus*, from Trinidad. A conspicuous black spot occurs on the dorsal fin of the male in one race of this species, but it is wanting in all females of the species and also in males of a second race with which crosses were made. This spot was transmitted to all male offspring of the spotted fish, regardless of the mother's ancestry, but it was not found in the female offspring, nor did it reappear in the male offspring of such females, when they were mated with males which lacked the spot.

Further, sons of the spotted male, transmitted the spot to *all* their male offspring, not to half of them, as would be the case with an ordinary dominant Mendelian character. The inheritance of the character appears to be exclusively from father to son, females neither possessing nor transmitting it. Evidently the sperm is the sole vehicle of its transmission. It does not get into the egg at all. Moreover it is apparently transmitted by only *half* the sperm cells, those namely which are male determining in function. It therefore has, as Schmidt points out, exactly the distribution of a Y chromosome, and he suggests that a Y

[1] *C. R. Travaux Laboratoire Carlsberg*, Vol. 14, No. 8, Copenhagen, 1920.

chromosome may be the vehicle of transmission, a matter which his colleague, Winge, has under investigation.

In all previously known cases of sex-linked inheritance, the egg as well as the sperm may serve as a vehicle of transmission. In *Drosophila* and man it is supposed that the X chromosome bears sex-linked characters, the female being in formula XX, so that every egg after maturation contains an X, a bearer of sex-linked characters; but in the same species the male is XY in formula, a Y replacing one of the X's found in the female. This X consequently will occur in only half of the sperm produced by the XY male, namely those which pass into female offspring, but the other sperms will contain Y instead of X and they will pass into male offspring. However, up to the appearance of Schmidt's paper, no characters had been observed to follow the path of a Y chromosome in transmission, so that Morgan characterizes the Y chromosome of *Drosophila* as "empty."

Before the mechanism of transmission of sex-linked characters had been worked out, I suggested in 1909[2] that the Y chromosome afforded a suitable vehicle for transmitting the secondary sex characters of males. But until Schmidt's publication was made this suggestion had found no support in known facts, and the demonstration by Morgan and others that characters which make their first appearance or are most often found in males, may nevertheless have their genetic basis in an X chromosome, seemed to discredit the Y chromosome as a possible organ of inheritance. The discovery of Schmidt leads me to call attention to my earlier suggestion, not for the mere satisfaction of saying "I told you so," but to renew the further suggestion which I then made and which still lacks verification, that the Y chromosome may contain the clew to the explanation of that other and very different type of sex-linked inheritance found in *Abraxas* and subsequently found to occur also in poultry.

2 "A Mendelian View of Sex-heredity," Science Vol. 29, pp. 395–400, March 5, 1909.

Studies of sex-determination made in the last twenty years show unmistakably that in diœcious species the chromatin composition of the nucleus of the egg determines the sex of the individual into which the egg develops. Further, in many cases, if not in all, the quantity of chromatin is clearly decisive between maleness or femaleness in the individual which develops from the egg. Thus in parthenogenesis an egg which develops without chromatin reduction (in maturation) regularly develops into a female; but an egg which first undergoes chromatin reduction (usually by exactly half the total number of chromosomes), before it begins development into an embryo, if it remains unfertilized, now develops into a male. Yet if the egg, after undergoing chromatin reduction in maturation, receives a new complement of chromatin by being fertilized, it is restored again to the female status. Femaleness thus goes with the full chromatin equipment of the species, maleness with a less complete chromatin equipment.

It has further become clear through studies of sex-linked inheritance that not all kinds of chromatin are equally influential in determining sex, but that a particular chromosome called X is of preëminent, if not exclusive importance in determining sex. In the case first clearly worked out by Wilson, that of the squash-bug, the female bears in each cell-nucleus a pair of X's, whereas the male contains but one. As the remaining ten chromosomes of this species are paired in both sexes, the total chromosome count for the female is $20+2X=22$; for the male it is $20+X=21$. The only discoverable difference between the two sexes is in the number of the X chromosomes. The number is two in the female, one in the male. The metabolic grade of maleness is attained when, in addition to the other ten pairs of chromosomes, a single X chromosome is present in the cell, but the grade of femaleness is attained only when the further addition of a second X is made. Every kind of chromatin of the species is present in the male, but a particular kind of chromatin is present in less

amount in the male than in the female. Now if the only difference between the two sexes lies in one chromosome, it is conceivable that one X might be dropped from each sex, without disturbing the sex balance. Besides the paired chromosomes which were alike in both sexes, the female would now contain one X, the male none. It is possible that this hypothetical simpler condition actually preceded the other, that the X chromosome really was at first a structure developed in the egg and handed on by this route from mother to daughter as an exclusively female structure, very much as extra-nuclear structures or plastids (chromatophores) are handed on in certain plants, or in the egg of the green hydra, being never found in the male gamete. It may be also that this condition is realized in birds and moths, but of this more later.

Now Wilson has shown, by comparative studies of the sex-determining mechanism of insects, that the single unpaired X of the male is apt to acquire a mate which he calls Y, of unknown origin and function but certainly of different nature from X. This is frequently much smaller than its synaptic mate, X, but in other cases is almost or quite as large as X, so that the chromosome count shows the same number of pairs in both sexes. Only comparative studies, coupled with experiments in sex-linked inheritance, show that throughout the series there is an odd or single X in the male, while in the female there is a pair of X's. The Y chromosome, which makes its appearance as a mate of the odd X, is now a purely male structure, counterpart of the hypothetical original single X of the female, and Schmidt's observations show that such a structure may perfectly well be a vehicle of transmission in heredity of characters which are the exclusive possession of males. For males would now form (as in *Drosophila*) two kinds of sperm, differing only in one respect. One type containing X would be female determining, the other type containing Y would be male determining when respectively they fertilized the single type of mature egg, which contained one X. If, however, by non-disjunction in maturation an egg retained two X's and was fertilized by a Y sperm, it would of necessity develop into a female (2X) (as is the case in *Drosophila,* Bridges) which nevertheless would possess inherited characters previously possessed only by males, because of the presence of the Y. Eggs of this character might (as in *Drosophila*) produce four types of gametes, viz., XX and Y, or X and XY. Sperm also (as in *Drosophila*) might be produced of the classes X, Y, and XY. A great variety of possible combinations would result, as Bridges has shown in cases of non-disjunction in *Drosophila.* Of these various combinations, two sets might give rise to stable self-perpetuating systems of the *Abraxas* type, viz., (1) female XX-Y, in which the two X's are permanently united into a single body which acts as the synaptic mate of Y, while the male is Y-Y in formula; or (2) female X-Y with an increased potency of X sufficient to determine femaleness in single dose, male Y-Y. It is true that in *Drosophila* Bridges finds Y-Y zygotes non-viable but this is no evidence that Y-Y zygotes would be non-viable in all organisms. It is also true that he finds that the non-disjoining X's may later separate, but this would not preclude permanent union of two X's in other organisms.

On the other hand, it is conceivable that the poultry type of sex-linked inheritance may not have been derived from the *Drosophila* type at all but from a simpler primitive condition in which the female bore one X, the male no X. If in a species of this type, a Y chromosome appeared in the egg as the synaptic mate of X, it would necessarily go exclusively into those eggs which were to become males and would thus seem to be an exclusive male possession even though it had originated in a female. But the male which had received Y from his mother would now produce two types of sperm, Y and no-Y. An egg transmitting Y, if fertilized by sperm also Y would produce a Y-Y male, which might prove to have greater survival value than the male which contained no Y or only a single Y. If this happened, the race would become permanently, female X-Y, male Y-Y, which in

so far as Y is concerned is exactly the condition demanded in the poultry type of sex-linked inheritance for a carrier of sex-linked characters. This line of thought leads to the following hypothetical outline of the evolution of sex-linked inheritance.

1. Sex-linked inheritance begins with the inclusion in the nucleus of the egg of a structure, X, perhaps originally found in the cytoplasm and handed on there from egg to egg in the female line, never in the male line. This structure is itself (or is attached to) the specific determiner of femaleness; it is an element which keeps the organism at the metabolic level of femaleness, its absence allowing the organism to drop down to the metabolic level of maleness. Characters (genes) located in X would pass only from mother to daughter.

2. From the foregoing state two divergent lines of evolution may have arisen.

(*a*) In one the X chromosome becomes duplicated in the female (perhaps by splitting at the reduction division) and is in consequence found in all eggs after maturation. It thus passes into male zygotes as well as female zygotes. The female will now be XX in formula, the male XO. Whatever inherited characters have their genes located in the X chromosome will now be transmitted as in *Drosophila* and man.

(*b*) A chromosome, Y, not concerned primarily in sex-determination, may develop as the synaptic mate of X in the egg; it would at once pass into male offspring and being transmitted in sperm cells would speedily produce the male type Y-Y. But in the female, Y would be kept from becoming duplex by the presence of X, the synaptic mate of Y. If Y contained genes, these would be transmitted as are the genes of sex-linked characters in poultry and other birds and in moths.

3. If in the *Drosophila* type of inheritance, Y should come to contain genes, these would be handed on from father to son, without ever entering a female zygote (*Lebistes* type). In the poultry type of sex-linked inheritance, Y would not afford a suitable mechanism for this one-sided type of inheritance, since Y there passes into females. Hence the *Lebistes* type must be a further evolution of the *Drosophila* and human type, not of the poultry type.

W. E. Castle

Bussey Institution,
March 1, 1921

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION A AND ASSOCIATED MATHEMATICAL ORGANIZATIONS

Section A of the American Association for the Advancement of Science met in Chicago on Wednesday morning, December 29, in joint session with the American Mathematical Society (Chicago Section), the Mathematical Association of America, and a group of persons interested in the History of Science.[1] Professor D. R. Curtiss, chairman of the Section, presided. Professor O. D. Kellogg, of Harvard University, the retiring chairman, gave an address entitled "A decade of American mathematics." Professor Florian Cajori gave an illustrated address on "The evolution of algebraic notations." This meeting was attended by more than 200 persons, including 80 members of the American Mathematical Society and 150 members of the Mathematical Association of America.

At the business meeting following the program, the nominations made by the sectional committee (on December 27) were approved. These nominations, which were acted upon by the council of the association at its meeting of December 31st, were as follows:

I. For Chairman of the Section, who will preside at Toronto and give his retiring address at Boston, Oswald Veblen, Princeton University.

II. For Secretary of the Section, who will hold office until the meeting of 1924–25, William H. Roever, Washington University.

According to the new constitution four instead of five members, in addition to the chairman and secretary, constitute the Sectional Committee. Therefore it was unnecessary to elect a member to succeed Professor H. L. Rietz, whose term expired with the Chicago meeting. The four members are: Dunham Jackson (January, 1920, to December, 1924), Minneapolis, Minn.; A. D. Pitcher (January, 1920, to December, 1923), Cleveland, Ohio; Gilbert A. Bliss (January, 1920, to December, 1922), Chicago, Illinois; James M. Page (January,

[1] Science, February 18, 1921 (p. 164).

1920, to December, 1921), Charlotteville, Virginia. Professor D. R. Curtiss, Northwestern University, will give the retiring address at Toronto (1921–1922).

A joint dinner for mathematicians and astronomers was given at the Quadrangle Club of Chicago University on Wednesday evening, December 29.

The following announcements concerning members of Section A are of special interest:

(1) Professor E. H. Moore, head of the department of mathematics of the University of Chicago, was elected president of the American Association for the Advancement of Science.

(2) Professor G. A. Bliss, of the University of Chicago, was elected president of the American Mathematical Society.

(3) Professor G. A. Miller, of the University of Illinois, was elected president of the Mathematical Association of America, and member of the executive committee of the council of the American Association for the Advancement of Science.

(4) The American Mathematical Society and the Mathematical Association of America were invited by the American Association for the Advancement of Science to become affiliated societies. As soon as these organizations officially accept the offer to affiliate, they will be represented on the council of the association by their respective secretaries, Professor R. G. D. Richardson, of Brown University, and Professor W. D. Cairns, of Oberlin College.

At the sessions of the American Mathematical Society on Wednesday afternoon and on Thursday, the following papers were read:

Construction of doubly periodic functions with singular points in the period parallelogram: PROFESSOR W. PAUL WEBBER.

Boundary value problems with regular singular points: PROFESSOR H. J. ETTLINGER. (Second paper.)

Note on the permutability of functions which have the same Schmidt fundamental functions: PROFESSOR E. W. CHITTENDEN.

On kernels which have no Fredholm fundamental functions: PROFESSOR CHITTENDEN.

Note on convergence in mean: PROFESSOR CHITTENDEN.

Determination of the spherical transformation in Grassmann's extensive algebra: DR. A. R. SCHWEITZER.

On the relation of iterative compositional equations to Lie's theory of transformation groups: DR. SCHWEITZER.

Isothermally conjugate nets: PROFESSOR E. J. WILCZYNSKI.

Transformation of conjugate nets into conjugate nets: PROFESSOR WILCZYNSKI.

Conditions under which one of two given closed linear point sets may be thrown into the other one by a continuous transformation of a plane into itself: PROFESSOR R. L. MOORE.

A closed connected set of points which contains no simple continuous arc: PROFESSOR MOORE.

On the history of symbols for n-factorial: PROFESSOR FLORIAN CAJORI.

Homogeneous polynomials with a multiplication theorem: PROFESSOR L. E. DICKSON.

Applications of algebraic and hypercomplex numbers to the complete solution in integers of quadratic diophantine equations in several variables: PROFESSOR DICKSON.

Arithmetic of quaternions: PROFESSOR DICKSON.

Determination of all general homogeneous polynomials expressible as determinants with linear elements: PROFESSOR DICKSON.

I-conjugate operators of an abelian group: PROFESSOR G. A. MILLER.

The integrals and associated divergent series: PROFESSOR W. D. MACMILLAN.

Elementary geometry in n-dimensions: PROFESSOR R. P. BAKER.

Note on an ambiguous case of approximation: PROFESSOR DUNHAM JACKSON.

On the method of least m-th powers for a set of simultaneous equations: PROFESSOR JACKSON.

Note on the convergence of weighted trigonometric series: PROFESSOR JACKSON.

On polynomials and their residue systems: PROFESSOR AUBREY J. KEMPNER. (Second paper.)

Expansion of the double frequency function into a series of Hermite's polynomials: PROFESSOR E. R. SMITH.

On amicable numbers and their generalizations: PROFESSOR T. E. MASON.

On the complete characterization of the set of points of "approximate" continuity: PROFESSOR HENRY BLUMBERG.

Comparison of different line-geometric representations for functions of a complex variable: DR. GLADYS E. C. GIBBENS.

On the trigonometric representation of an ill-defined function: PROFESSOR DUNHAM JACKSON.

An adaptation of Bing's paradox, involving an arbitrary a priori probability: PROFESSOR EDWARD L. DODD.

A convergence theorem of Osgood's with an application: PROFESSOR O. D. KELLOGG.

Invariant points under transformations in function space: PROFESSORS G. D. BIRKHOFF and O. D. KELLOGG.

Fundamental points of potential theory: PROFESSOR G. C. EVANS.

Functionals of summable functions: PROFESSOR W. L. HART.

The papers of Professors Moore, Dodd and Evans, and the paper of Dr. Gibbens were read by title.

The New York meeting of the society was reported in SCIENCE of February 25.

At the sessions of the Mathematical Association of America on Tuesday and Wednesday afternoon the following papers were read:

Geometrical development of analytical ideas: Professor L. C. Karpinski, University of Michigan.

The anharmonic ratio in projective geometry: Professor E. B. Stouffer, University of Kansas.

The association's ideal for expository papers: Professor E. J. Wilczynski. (Introductory Note.)

The first work on mathematics printed in the new world: Professor David Eugene Smith, Columbia University.

Rolle's theorem and its generalizations: Professor A. J. Kempner, University of Illinois.

Some geometrical aspects of the theory of relativity: Professor L. W. Dowling, University of Wisconsin.

Note on "the metric question from the historical standpoint": Professor L. C. Karpinski, University of Michigan.

General aspects of the problem of interpolation: Professor Dunham Jackson, University of Minnesota.

Construction of double entry tables: Professor A. A. Bennett, in charge of the U. S. Ordnance Ballistic Station, Baltimore, Md.

Certain general properties of functions: Professor Henry Blumberg, University of Illinois.

In addition to the election of Professor G. A. Miller as president of the Mathematical Association of America, the following elections were made:

For Vice-president: R. C. Archibald, Brown University; R. D. Carmichael, University of Illinois.

For Members of the Board of Trustees: A. A. Bennett, U. S. Ordnance Ballistic Station; Florian Cajori, University of California; H. L. Rietz, University of Iowa; D. E. Smith, Columbia University; C. F. Gummer, Queen's University.

Seventy-two individuals and three institutions were elected to membership and a Texas Section of the association was approved.

Wm. H. Roever,
Secretary, Section A;

Arnold Dresden,
Secretary, American Mathematical Society, Chicago Section;

W. D. Cairns,
Secretary, Mathematical Association of America

THE AMERICAN SOCIETY OF AGRONOMY

The winter meeting of the society was held at Chicago in affiliation with the American Association for the Advancement of Science, on Friday, December 31.

The program follows:

SYMPOSIUM

Our Present Knowledge of Methods of Corn Breeding

Leader: H. K. Hayes, University of Minnesota, St. Paul, Minn.

The experimental basis for the present status of corn breeding: F. D. Richey. A review of experimental efforts to increase corn yields by breeding points to the following conclusions: (1) Mass selection on the basis of production of mature, sound grain per plant, under conditions of uniform stand and fertility, may be recommended as a means of at least maintaining yields. (2) There is no evidence that ear-to-row breeding can be relied upon to obtain increased yields commensurate with the cost. (3) First generation varietal crosses, and crosses or double crosses between pure lines, offer possibilities for obtaining larger yields; but the value of each combination must be determined experimentally. (4) The evidence as a whole shows clearly the value of selection in obtaining better adaptation to a specific environment and the value of hybrid vigor in obtaining larger yields. These principles, in connection with the Mendelian interpretation of heterosis as due to linked dominant growth factors, point to selection, hybridization, and further selection, all based on pure lines and controlled pollination, as the only sound basis for real corn improvement.

The bearing of modern genetic studies on corn breeding: R. A. Emerson.

Corn breeding as a hobby: H. A. Wallace. Eight rather late corn varieties were combined as pollinating parents with each of twenty rather early mother parents. Of these 160 combinations, 50 were tried out in comparison with the Iowa Station strain of Reids at Ames and the others were tried out at Des Moines. At both places a strain of Reids known as Iowa 10 proved to be the best of the eight as a pollinating parent and a Kentucky strain of Johnson Co. White proved to be poorest. During 1916, 1917, 1918 and 1919, the Iowa Station has tried out 287 hybrids and of these only 50 have outyielded the station strain of Reids. There is probably about one chance in one hundred of finding a cross of two distinct varieties which will prove to be an improvement on the best of the varieties now in use. The most promising cross so far discovered in Iowa is a cross of the Iowa Station strain of Reids with Argentine corn.

The author believes that there must eventually be special purpose corns such as 90-day corns, silage corns, etc., as well as standard grain vari-

eties. He advocates as an aid to specialized corn breeding the formation of a Corn Record Association for the registration of promising selfed strains. By proper encouragement, he believes that retired farmers could be interested in the development of selfed strains of corn as a hobby.

Progress report on the method of selection in self-fertilized lines: D. F. JONES. Selection in self-fertilized lines makes possible a control of the heredity from both the pollen parent and seed parent. Some seventy-five lines selected in this way and started from four different varieties chosen from among the best as grown in Connecticut have shown the usual segregation of type and reduction in vigor. Many clear-cut undesirable characters have appeared and are being eliminated. For example: fifteen lines have contained various forms of chlorophyll-deficient seedlings; ten, the "defective seed" factor; three, different forms of dwarf plants; two, golden plants; three, variegated plants; and five, various forms of sterility. Along with these outstanding weaknesses other marked variations in height, size of stalk, type of tassel and ear, and color of foliage have appeared. Such differences as these form the material for effective selection for productiveness.

Overcoming "root rot" by breeding: W. D. VALLEAU. In breeding for resistance to corn root rot, the fact should be kept in mind that disease-free seed probably does not exist, under average field conditions. All plants examined in the field as well as those grown in the sand box have been found to be infected. Differences in time of death of plants of a given variety under field conditions are dependent on differences in resistance of the plants to root rot, and are not the result of planting diseased or disease-free seed. Various seed treatments, including all of those commonly recommended for small grains, have failed as a means of control. Attempts to obtain disease-free seed by harvesting before ripening and protecting ears from further infection has failed as infection occurs before the milk stage. Ears may be graded according to resistance by growing seedlings in a sand box and noting the time required for the individual seedlings to rot to the surface of the sand. By this method premature death of plants has been reduced from an average of 36.1 in the checks to 8.4 per cent. in the plants from the most resistant ears. An attempt is being made to obtain pure lines of the most resistant strains by self-pollination. Self-pollination, even for many years, does not materially reduce the number of days between the death of the first and last plant from a given ear, over open-pollinated ears, in the sand box. Preliminary experiments indicate that field selection of seed from the longest-lived plants may prove a means of obtaining seed of a high degree of resistance.

Ear type selection and yield in corn: T. A. KIESSELBACH. From the seed standpoint, ear characteristics of dent corn fall into two classes, utilitarian and non-utilitarian. The utilitarian characters comprise those which indicate soundness and hereditary adaptation to certain environmental conditions. This adaptation can not be reliably forecasted by a mere ear examination. However, associated with marked differences in the plant growth habits resultant from corresponding regional differences in the environment (and especially climatic differences), are found rather distinct adaptive ear type characteristics. The more adverse plant growth conditions are for corn, the more nearly do the adapted types approach the small stalk, low leaf area, slender ear and smooth shallow kernel of flint corn. Approach of a balance or equilibrium between adverse environment and the plant and its ear type, is frequently spoken of as "running out" of the corn, whereas such a reaction is an actual betterment for the prevailing conditions. The corn grower is coming to recognize the advantage of modifying his conception of ear type to harmonize with the environment of his locality. There is no such thing as a universal best type.

Progress report on corn disease investigations: JAMES R. HOLBERT. Cooperative investigations by the Bureau of Plant Industry and certain agricultural experiment stations during the past three years have shown that the root, stalk and ear rot diseases of corn are widely distributed in this country wherever corn is grown. These diseases have been found to be a limiting factor in corn production. They may be largely controlled by careful field selection of healthy, productive plants, physical selection of seed ears, and the proper use of the germination test, as described in Farmer's Bulletin 1176. The continued selection of seed according to these recommendations has been effective in improving a number of varieties of corn. Other means for control, such as the breeding of resistant varieties, soil sanitation, and the use of certain soil correctives, are being investigated.

The present status of continuous selection experiments with corn: L. H. SMITH. Several lines

of continuous selection in corn for certain special characteristics, including both chemical and physical properties, have been carried on for many years at the Illinois Agricultural Experiment Station. Twenty-four generations of selection to influence the composition of the grain show very marked responses, and from a single original variety four diverse strains have been established, namely, high protein, low protein, high oil, and low oil. Similarly, high- and low-ear strains as well as erect- and declining-ear strains have been produced. Another example of this response to selection has been the development of a two-eared strain from an ordinary single-eared variety. In like manner differences in yield have been induced by similar methods of selection. These results all go to show something of the possibilities of profoundly modifying various characteristics by continuous selection in a cross-fertilized plant such as corn.

First generation corn varietal crosses: Fred Griffee. A brief review is made of the development of the theory which accounts for the increased vigor of F_1 crosses. Experiments are reviewed in which F_1 corn crosses are compared with their parents for yield of grain. Of 146 crosses, 113 exceeded the parental average in yield of grain and 84 exceeded the better parent. At the Minnesota station 5 flint-dent crosses tested for a period of two to six years yielded an average of 7.7 per cent. more shelled corn per acre than either parent. Particular attention is called to the cross between Minnesota No. 13 and Squaw Flint which yielded 8.4 per cent. more shelled corn per acre than Minnesota No. 13, which is the higher yielding parent, and was a week to ten days earlier in maturity than Minnesota No. 13. Such a cross appears of considerable promise for sections where early maturity is an important factor. During the first three years of the study a strain of Minnesota No. 13 was used which had been selected for type for several years. In the latter years this strain was selected primarily for yield. The increase in yield of shelled corn per acre of the F_1 cross over the better parent has averaged less for the last two years than for the first four years of the tests in the case of crosses with Minnesota No. 13. On the basis of these results it appears that, if corn were selected primarily on the basis of yield, the value of F_1 varietal crosses would be somewhat questionable.

Rust and the weather: H. L. Walster. At Fargo, N. D., blue stem spring wheat averaged 7.1 bushels per acre in 5 seasons when rust epidemics occurred, and 26.7 bushels per acre in 5 non-rust seasons. The average minimal and maximal temperatures by 10-day periods from the date of seeding show the following differences as between the respective 5-year periods:

Average Differences in Degrees F. for Each 10-day Period after Seeding. Five-year Averages

			1st	2d	3d	4th	5th	6th	7th	8th	9th
Minimals of 5 Good Years	Minus	Minimals of 5 Rust Years	−1.76	+8.50	+6.72	+7.70	+2.84	+7.24	+8.32	+1.42	+2.94
Maximals of 5 Rust Years	Minus	Maximals of 5 Good Years	−1.54	+9.16	+4.96	+4.48	+0.28	+5.74	+5.72	+4.10	+0.72

During rust years maximal temperatures rose more rapidly and reached their highest point sooner than in non-rust years. The average rainfall during April, May, June and July averaged higher in rust years than in good years. When high rainfall occurred in good years danger of rust has been offset by low temperatures. When excessively high temperatures have occurred in good years, danger of rust has been offset by droughty conditions.

P. E. Brown,
Secretary-Treasurer

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